## REMARKS

Claims 4-8 and 12 were previously cancelled. Claims 18 and 19 are currently added. Accordingly, Claims 1-3, 9-11 and 13-19 are currently pending.

In reply to the May 15, 2006 Final Office Action and to the October 17, 2006 interview conducted at the U.S. Patent and Trademark Office, Applicants filed a response on November 15, 2006.

In reply to Applicants' November 15, 2006 Response, the Examiner issued an Advisory Action on March 12, 2007. In the Advisory Action, the Examiner stated that the Applicants' response did not place the application in condition for allowance. Since the Applicants inadvertently did not file a Notice of Appeal along with their November 15, 2006 Response, the application became unintentionally abandoned.

Along with the instant Amendment is a Request for Continued Examination and a Petition to Revive.

Applicants respectfully disagree with the Examiner's statements in the Advisory Action, as discussed below.

### Present Invention

The present invention provides heated-expanded foodstuff with a surprisingly high degree of expansion. The method comprises heating foodstuff which comprises non-cereal amylopectin starch, such as potato amylopectin starch, to a temperature above the glass transition temperature of the starch. After a surprisingly high degree of expansion, the foodstuff is cooled.

## Rejection under 35 U.S.C. § 103

The Examiner has rejected Claims 1-3, 9-11 and 13-17 as being obvious over U.S. Patent No. 4,409,250 (van Hulle et al.) in view of U.S. Patent No. 6,488,980 (Jeffcoat et al.).

### *Executive Summary*

This Executive Summary summarizes some of the primary reasons why the invention as claimed is not obvious.

► The viscosity of amylopectin potato starch is much **greater than** natural potato starch and waxy grain starch.

► *Generally*, the viscosity of a composition and the ease with which the composition expands are **inversely related**.

► At the time of the present invention, *it was believed* that this general rule applied to starch.

► The inventors surprisingly discovered that amylopectin potato starch expanded to a much greater extent than natural potato starch. Such a result was contrary to the predictions.

### *Detailed Explanation of Unobviousness of Present Invention*

*Viscosity of amylopectin potato starch*

The viscosity of amylopectin potato starch is much greater than natural potato starch and waxy grain starch. As evidence, Applicants point to the reference cited by the Examiner, U.S. Patent No. 6,488,980 (Jeffcoat et al.). In particular, in col. 4, lines 18-22, of Jeffcoat et

al., it is stated that "modified waxy potato starch has an unexpectedly high viscosity...at least fifteen times that of the modified starch prepared from common (non-waxy) potato starch."

*Generally, composition's viscosity is inversely related to the ease of expansion.*

It is generally understood by those skilled in the art that *typically* the viscosity of a composition and the ease with which the composition expands are inversely related, i.e., the more viscous a composition is, the more energy is needed to expand the composition.

This general rule is embodied in the equation for bubble growth rate (i.e., expansion):

$$dR/dt = RÄP/ç$$

where R, ç, and ÄP are respectively the bubble radius, melt viscosity, and the vapor pressure difference between the interior of a bubble and the surroundings

*It was believed that inverse relationship between expansion and viscosity applied to starch.*

At the time of the present invention, *it was believed* that this general rule applied to starch. The Examiner requested evidence that *it was believed* that the bubble growth rate equation applied to starch. The Applicants provide the following evidence.

In their November 15, 2006 Response, Applicants enclosed references showing that the equation for bubble growth rate *was thought to* specifically apply to starch at the time of the present invention, i.e., *Kokini et al. and Valle et al.* In her Advisory Action, the Examiner stated that Valle et al. was not considered because it was illegible. Accordingly, a new copy of Valle et al. is enclosed.

*Kokini et al.*

("The Role of Rheological Properties on Extrudate Expansion" Food Extrusion Science and Technology, J.L. Kokini, C.T. Ho, M. V. Karwe, Eds. 1992, 631-652)

Kokini et al. is a chapter in a book reviewing the state of the art teaching pertaining to expansion properties of food extrudates, including dough. Beginning on the bottom of page 632, is a section entitled "Theoretical Considerations in Bubble Growth Dynamics." Within this section, on page 634, second full paragraph, is the equation for bubble growth rate (i.e., expansion):

$$dR/dt = RÄP/ç$$

where R, ç, and ÄP are respectively the bubble radius, melt viscosity, and the vapor pressure difference between the interior of a bubble and the surroundings

Below the equation, Kokini et al. concludes: "The expansion then can be assumed to be controlled by $\Delta P/\eta$." $\Delta P$ is the difference between the pressure inside the bubble and the pressure of the surroundings. The variable $\eta$ is the shear viscosity of a doughy mass. Accordingly, the state of the art teaching in 1992 was that the expansion of a doughy food product was inversely related to its viscosity.

On page 647, middle of paragraph, Kokini et al. confirms the inverse relationship applies to starch. In particular, Kokini et al. states: "The viscosity of the doughy mass in the die was calculated using the empirical equations presented earlier. Poor expansion can be observed at all moisture contents as the viscosity becomes higher."

Also, in the first paragraph, on page 632, Kokini et al. indicates that the state of the art is that "native starches having 50% amylose levels expanded best." Such a teaching is in direct contrast with the present invention which teaches using virtually all amylopectin root starch for maximum expansion.

*Valle et al.*

("Relations between Rheological Properties of Molten Starches and their Expansion Behavior in Extrusion," *Journal of Food Engineering* 1997, 31:277-295).

In the first sentence of their Abstract, Valle et al. summarize their study as follows:

> Starches with various amylose contents were expanded by extrusion through a specific slit die rheometer. At a given moisture content and temperature, volumetric **expansion** *increased* as melt **viscosity** *decreased*. (Emphasis added.)

Thus, the state of the art in 1996 was that starch expansion and viscosity were inversely related.

On page 278, last paragraph, Valle et al. mention the Kokini et al. equation which demonstrates the inverse relationship of viscosity and expansion.

On page 283, last paragraph, Valle et al. state that a typical volume expansion index (VEI) as a function of melt viscosity is presented in Figure 5. They conclude that "The strong negative influence of melt viscosity is confirmed..." Valle et al state that their finding is in agreement with other studies, including Kokini et al. This inverse relationship is easily discernable from Figures 5 and 6.

Additionally, in their Abstract, Valle et al. state: "At any temperature and moisture content, volumetric expansion increased with amylose content." Thus, in direct contradiction to the present invention, Valle et al. teach that expansion can be increased by adding amylose. On page 288, second paragraph, Valle et al. state that maximum expansion was found at an amylose content of 50%.

At the time of the present invention, a skilled artisan would have been familiar with the state of the art teaching that there is an inverse relationship between viscosity and ease of expansion for starch. Thus, a skilled artisan would have believed that a more viscous starch would expand to lesser degree *vis-à-vis* a less viscous starch when using the same amount of expansion energy.

As discussed by Dr. Semeijn during the October 17, 2006 interview, she and her colleagues were given the task to produce puffed snack products with amylopectin potato starch. Dr. Semeijn and her colleagues objected stating that such a task would not provide a desirable product. That is, since amylopectin potato starch is much more viscous than natural potato starch, it was believed that the resulting snack product would not have the desired volume of expansion. (See November 15, 2006 "Substance of the Interview.")

In the experiments that led to the present invention, it was surprisingly found that not only did the amylopectin potato starch expand as much as the natural potato starch in response to heating, but the amylopectin potato starch expanded much more than the natural potato starch. Such a result was contrary to the predictions.

*Prior art must be considered as a whole*

Van Hulle et al. teach using "doughs whose total amylopectin starch content ranges between about 30-95%" (col. 4, lines 53-55). Thus, van Hulle et al. do not teach that high amylopectin starch is preferred over other types of starch for use in their methods. Also, in the May 15, 2006 Office Action, the Examiner conceded that "[v]an Hulle et al. do not disclose their amylopectin starch is non-cereal amylopectin starch..." (See Office Action page 3, 1st paragraph.) In an attempt to remedy these deficiencies in van Hulle et al., the Examiner stated that Jeffcoat et al. disclose cross-linked waxy potato starch. In the Advisory Action, the Examiner states, "There is nothing in the prior art to van Hulle et al. and Jeffcoat et al. that teaches against using non-cereal amylopectin starch."

The Examiner is incorrect. As demonstrated above, the state of the art teaching *at the time of the present invention* was that the viscosity of a starch and its expansion were **inversely related**.

Jeffcoat et al. teach that amylopectin potato starch has an unexpectedly high viscosity, i.e., "at least fifteen times that of the modified starch prepared from common (non-waxy) potato starch."

Thus, a skilled artisan would not have used a more viscous starch (i.e., amylopectin potato starch) *vis-à-vis* a less viscous starch (i.e., amylopectin cereal starch) when a product with increased expansion was desired. Thus, Jeffcoat et al. **teach away** from using amylopectin potato starch in the methods of the present invention.

Thus, contrary to the Examiner's statements, at the time of the present invention, there was a clear teaching in the prior art as a whole against using non-cereal amylopectin starch when a more expanded foodstuff was desired. Accordingly, viewing the prior art as a whole, the present invention would not have been obvious.

*Response to Examiner's Other Statements*

In the Advisory Action, the Examiner states:

> [T]he statement made in the affidavit is contrary to what is being argued and claimed; applicant repeatedly argues that non-cereal amylopectin starch enhances expansion. A recognition of an inherent result and such result is also expected in the prior art material, then the result cannot be basis for patentable distinction.

The Examiner has seemed to have missed the point of Applicants' discussion. As demonstrated above, the state of the art teaching *at the time of the present invention* was that the viscosity of a starch and its expansion were **inversely related**. The inventors surprising discovered that this teaching did not apply to high amylopectin potato starch. Accordingly, the invention is not obvious.

*Conclusion*

Accordingly, Applicants have shown that at the time of the present invention, the teaching in the art was that there was an inverse relationship between starch viscosity and expansion.

The present invention directly contradicted the state of the art teaching. That is, it was surprisingly found that a more viscous starch resulted in greater expansion. In particular, non-cereal amylopectin starch is 15 times more viscous than native potato starch yet yielded a more highly expanded food product.

In fact, according to the experimental results in the specification, amylopectin potato starch yielded a foodstuff that was at least 15% more expanded than a foodstuff comprising a composition of native potato starch.

Additionally, Valle et al. and Kokini et al. reported that that for maximum expansion, amylose starch content should be at 50%. Again, such a teaching directly contradicts the present invention which requires at least 90 wt. %, more preferably at least 95 wt.%, most preferably 98 wt.% or 99 wt.% amylopectin root starch. See page 3, lines 22 to 26, of the specification.

**Rejection under 35 U.S.C. § 112**

In the Advisory Action, the Examiner maintains that she cannot find support for the "consisting essentially" language of Claims 16 and 17. Applicants disagree with the Examiner. The "consisting essentially of" language is supported by the specification, as explained below.

The transitional phrase "consisting essentially of" limits the scope of a claim to the specified materials "and those that do not materially affect the basic and novel characteristics" of the claimed invention (MPEP§2111.03).

The basic and novel characteristic of the present invention is the surprising degree of expansion of foodstuff using amylopectin potato starch versus using natural potato starch. It is clearly indicated throughout the specification that adding natural potato starch or cereal starch to a composition consisting essentially of amylopectin potato starch would reduce the expansion of a foodstuff.

Support for the "consisting essentially of" language can found throughout the specification, including, for example, in the paragraph bridging pages 3 and 4. There it is stated that the present invention provides a composition containing non-cereal amylopectin starch; and "only water need to be added for preparing the [composition], said composition *optionally* containing other starches..."

Thus, the specification provides clear support for a composition in which the only starch used is non-cereal amylopectin cereal starch. Since starch is shown to be the only component that materially affects the basic and novel characteristics of the claimed invention, i.e., the expansion ability, there is support for the "consisting essentially of" language.

Moreover, the specification provides working examples for the "consisting essentially of" language. For instance, see Table 1 on page 10. **Example 3** contains amylopectin potato starch and waxy maize starch. In **Example 4**, the waxy maize starch is replaced with amylopectin potato starch. Thus, the specification specifically describes a composition consisting essentially of a non-cereal amylopectin starch (i.e., Example 4). The volume of expansion in Example 4 is about 25% greater than that of Example 3.

In view of the above discussion, Applicants request that the Examiner reconsider her assessment.

Also note, Claims 16 and 17 recite a degree of expansion as suggested by the Examiner. (June 29, 2005 Office Action page 4, 1st paragraph.) In particular, these claims recite a foodstuff comprising a composition, wherein said composition consists essentially of a non-cereal amylopectin starch having an amylopectin content of at least 90 weight percent "wherein said heat-expanded foodstuff is at least 15% more expanded than a foodstuff comprising a composition consisting essentially of native potato starch obtained by the same method."

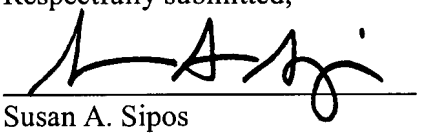
Support for these claims can be found throughout the specification. For example, the phrase "wherein said heat-expanded foodstuff is at least 15% more expanded than a foodstuff comprising a composition comprising essentially of native potato starch obtained by the same method" is supported by Table 2.

**New Claims 18 and 19**

New Claims 18 and 19 recite the same subject matter as Claims 16 and 17 except that the "consisting essentially of" language is replaced with "comprising."

Applicants respectfully submit that the application is in proper form for allowance, which action is earnestly solicited. If resolution of any remaining issue is required prior to allowance of this application, or if the Examiner has any suggestions for an amendment, it is respectfully requested that the examiner contact Applicants' undersigned attorney at the telephone number provided below.

Respectfully submitted,



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